Ground Water
of Vermont

JUL 32 10 40 AM '94

29 July 1994

Mr. Richard F. Spiese
State of Vermont DEC
HMMD - SMS
103 S. Main St.
Waterbury, VT 05671-0404

Re: Initial Site Investigation, Grand Isle Store, Grand Isle, VT (VT DEC Site #93-1525).

Dear Mr. Spiese,

Please find enclosed a copy of the above-referenced document. The report summarizes the results of an initial investigation performed at the site.

Please call me at (802) 860-6065 if you have any questions or comments on this work.

Sincerely,

Ron Miller
Hydrogeologist II and Regional Manager

Enclosure: Report
cc: Mr. Rob Wheeler, Vermont Federal Bank

RWM:rwm 94001L3.SAM

One Mill Street, Box C-5 • Burlington, VT 05401 • (802) 860-6065 • Fax (802) 860-6076

SITE INVESTIGATION REPORT

Grand Isle Store
Grand Isle, VT

VT DEC SITE #93-1525

25 July 1994

Prepared for:

Vermont Federal Bank
282 Williston Road
P.O. Box 700
Williston, VT 05495

Prepared by:

Ground Water of Vermont
1 Mill Street, Box C-5
Burlington, Vermont
(802) 860-6065

GWV Project #V94-001

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I. INTRODUCTION

This report discusses the results of a site investigation at the Grand Isle Store in Grand Isle, Vermont. The report has been prepared by Ground Water of Vermont (GWV) for Vermont Federal Bank (VFB) of Williston, VT.

The site investigation has been conducted to fulfill requests made by Mr. Chuck Schwer of the Vermont Department of Environmental Conservation (VT DEC) Sites Management Section (SMS) in a 30 December 1993 letter to Mr. Rob Wheeler of the VFB. The VT DEC requested that additional work be conducted at the site after receiving the 2 November 1993 GWV closure report for a diesel-fuel underground storage tank (UST) at the site. The VT DEC requested the following:

1. Determine the degree and extent of contamination, if any, to ground water;
2. Determine the potential for sensitive receptors to be impacted by identified contamination;
3. Determine the need for a long-term treatment or monitoring plan for the site;
4. Submit to the SMS a summary report outlining the work performed and providing conclusions and recommendations.

On 18 January 1994, the Vermont Federal Bank retained the services of Ground Water of Vermont to perform this work. GWV submitted a preliminary work plan and cost estimate to the VT DEC on 18 January 1994. The VT DEC approved the work plan and cost estimate on 11 February 1994.

The work plan was revised on 2 June 1994, after the owner of four monitoring wells on the site, S.B. Collins, Inc. of St. Albans, Vermont declined to provide access to these wells for purposes of collecting ground water samples. The revised work plan called for the installation of two additional soil borings/monitoring wells at the site, and the collection and analysis of ground water samples from these wells and from the two existing wells that were owned by the property owner. The revised work plan was approved by the VFB on 7 June 1994, and by the property owner and the VT DEC on 10 June 1994.

1.1 Scope of Work

To accomplish the investigation objectives, GWV has performed the following:

- Reviewed existing data on the site;
- Supervised the installation of two additional soil boring/monitoring wells at the site;
- Field-screened soils from the borings for the presence of volatile petroleum compounds with a photoionization detector;
- Determined ground water flow direction and gradient;

- Collected and submitted for laboratory analysis ground water samples from three ground water monitoring wells (one of the four wells was dry);
- Identified potential receptors of the contamination;
- Assessed the risk that the contamination poses to these potential receptors;
- Evaluated the need for treatment and/or a long-term monitoring plan for the site; and
- Prepared a summary report that details the work performed and provides conclusions and recommendations.

1.2 Site Location and Physical Setting

The site is located at the southwest corner of U.S. Route 2 and Hyde Road in the Town of Grand Isle, Vermont (see Figure 1, Site Location Map). The site consists of a wood frame building on a 0.48 acre lot (see Figure 2, Site Plan).

The site is located on Grand Isle, an island in Lake Champlain. Topography at the site slopes gently to moderately downward toward the east. Surface drainage is generally eastward toward Pearl Bay, which is located approximately one-half mile east of the site.

The surficial materials at the site are mapped as glacial till (Doll, 1961). The mapped surficial geology was confirmed by borings performed at the site. Bedrock underlying the site is mapped as the Stony Point Formation (Doll, 1961). The Stony Point Formation is Ordovician in age, and is principally comprised of calcareous shale. Auger cuttings collected from the soil borings confirmed the mapped bedrock geology.

2.0 SITE HISTORY

The site is currently owned by Steve Debenham of Grand Isle, Vermont, subject to a mortgage held by Vermont Federal Bank of Williston, VT, and is used as a gasoline station and general store. According to a Phase II Environmental Site Assessment (ESA) report completed in March 1992 by Wagner, Heindel, and Noyes (WH & N), the present building was constructed in approximately 1839, and has operated as a general store throughout its history. The WH&N ESA estimated that the property had dispensed gasoline for retail sale since the 1920s.

Three gasoline underground storage tanks (USTs), owned by S.B. Collins, Inc. of St. Albans, Vermont, are currently in use at the site. According to State of Vermont files, one 4,000 gallon UST was installed in 1978, and two 1,000-gallon USTs were installed in 1983. All of the gasoline USTs are reportedly of single-walled steel construction. A single-walled steel 500-gallon diesel UST of unknown age, owned by Mr. Debenham, was closed in place on 28 October 1993. GWV prepared the UST closure report, and submitted it to the State of Vermont on 2 November 1993.

Prior to the commencement of this investigation, six shallow ground water monitoring wells had been installed in the surficial aquifer at the site. Four of the six wells were installed by S.B. Collins in 1991 to meet State of Vermont leak detection requirements; S.B. Collins maintains ownership of these wells. The construction of the S.B. Collins wells is unknown. Two additional monitoring wells were installed in 1991 under the supervision of WH & N as part of the Phase II ESA. Ground water samples were collected on 4 February 1992 from five of the six monitoring wells. Petroleum compounds were detected in all of the sampled monitoring wells except MW-C. A petroleum identification conducted on MW92-2 indicated that the petroleum signature was best matched by an unleaded fuel standard.

On 28 June 1993, GWV collected a ground water sample from MW92-2 and submitted it to an analytical laboratory for petroleum "fingerprint" analysis, to evaluate whether the diesel UST had leaked. The sample analytical results indicated that both gasoline and diesel fuel constituents were present in the ground water sample.

On 8 July 1993, three soil borings were installed by Adams Engineering of Underhill, Vermont under GWV supervision, in order to further evaluate whether the diesel UST had leaked. Soil samples were collected from the borings and screened for the presence of volatile organic compounds (VOCs) with a portable photoionization detector (PID). PID readings were less than 5 parts per million near the surface, then increased to 19 to 122 ppm at the water table. The absence of elevated PID readings near the surface was considered to be evidence that the petroleum compounds had been released from a failure of the UST system rather than from overfills or surface spills. Petroleum fingerprint analysis conducted on a sample collected from soils adjacent to the diesel UST indicated that the sample contained aged diesel fuel, but not gasoline. As a result of these findings, the diesel UST was abandoned and closed in place on 28 October 1993.

The diesel UST closure was conducted by Pollution Solutions of Vermont, of Williston, VT under the supervision of a GWV hydrogeologist. GWV submitted an UST closure report to the State of Vermont on 2 November 1993. A hole was observed in the bottom of the UST, and ground water was observed to be flowing into the UST through the hole. According to the closure report, the presence of water in the UST suggested that the water table elevation at the site was normally higher than the bottom of the diesel UST, preventing leakage of the UST contents except during periods of unusually low ground water. Petroleum fingerprint analysis conducted on a sample collected from soil immediately beneath the UST indicated the presence of "aged" diesel fuel compounds, which in turn suggested that the diesel UST system had not been actively leaking at the time of closure.

3.0 SUBSURFACE INVESTIGATION

3.1 Soil Boring/Monitoring Well Installation

On 15 June 1994, GWV supervised the installation of two additional soil boring/monitoring wells on the site. Approximate boring locations are shown on Figure 2. The soil boring/monitoring wells were installed by Adams Engineering of Underhill, Vermont, using a combination of vibratory casing and solid-stem auger techniques.

Monitoring well MW1 was located approximately 30 feet from the former diesel UST location in the probable downgradient direction, to further evaluate the extent of contaminant migration from the likely source area. Monitoring well MW2 was located adjacent to the closed diesel UST, in the likely downgradient direction, to evaluate the degree of contamination in the likely source area.

Both soil borings (MW1 and MW2) encountered dense glacial till from immediately below the pavement downward to the top of bedrock. Shale bedrock was encountered in the MW1 boring at a depth of six feet, and in the MW2 boring at a depth of nine feet. Soil characteristics are listed on the well logs in Appendix B.

Ground water was encountered in each of the boring locations, at depths of approximately four feet below ground surface. Monitoring wells were installed in each soil boring. Monitoring well construction details are included in the well logs in Appendix B.

3.2 Soil Screening Results

The screening results of soil samples collected from the borings indicate that soils on the site have been impacted by petroleum releases. The highest PID readings were obtained from MW1, located downgradient of the 4,000-gallon gasoline UST.

Soil samples were collected at five-foot intervals from each soil boring, using a driven casing sampler. The samples were screened in the field for volatile organic compounds (VOCs) with a Photovac TIP II portable photoionization detector (PID), which had been calibrated with isobutylene gas to a benzene reference. Results of the PID screening are presented in the well logs in Appendix B, and are summarized below.

PID readings in the MW1 boring were as follows : 358 ppm in the 1-to-2 foot depth sample and 1,047 ppm in the 4-to-6 foot sample. Gasoline-like odors were noted in most soil samples. PID readings in MW2 ranged from 101 parts per million (ppm) in the near-surface sample to 478 ppm in a soil sample collected from the 8-to-9 foot depth.

3.3 Determination of Ground Water Flow Direction and Gradient

On 22 June 1994, GWV determined that ground water in the surficial aquifer beneath the site is flowing toward the east, at an average gradient of approximately 12.5%. The unusually high gradient suggests that the glacial till soils have a very low hydraulic conductivity.

The GWV technician measured the depth to water in each of the four on-site monitoring wells for which access had been obtained. No water was present in monitoring well MW 92-1. Relative water table elevations in the other three wells were determined by subtracting the measured depth-to-water in each well from the surveyed relative top-of-casing elevation. The water level measurements and elevation calculations are presented in Table 1. Figure 3 is a ground water contour map for the site.

3.4 Ground Water Sampling and Analysis

Analytical results of samples collected from the four monitoring wells indicate that gasoline is the principal contaminant in ground water beneath the site, although one of the samples (MW1) also contained a minor amount of aged diesel-type fuel. Contaminant concentrations exceeded Vermont Ground Water Enforcement Standards only in monitoring well MW-1, which is located farthest from the former diesel UST, and directly downgradient of the 4,000-gallon gasoline UST.

On 22 June 1994, GWV collected ground water samples from each monitoring well that contained water after performing the depth-to-water measurements. Samples were collected according to GWV's Ground Water Sampling Protocol. GWV collected a trip blank, equipment blank and duplicate to verify proper quality assurance and quality control (QA/QC), as required by the VT DEC. The samples were analyzed for the volatile petroleum compounds benzene, toluene, ethylbenzene, and xylenes (collectively termed BTEX) and the gasoline additive methyl-tert butyl-ether (MTBE) by EPA Method 8260, and by petroleum fingerprint analysis to evaluate the relative contributions of gasoline and diesel fuels. Analytical results of this sampling are summarized in Table 2 of Appendix A. Laboratory report forms are included in Appendix C.

Petroleum compounds were detected in all of the sampled monitoring wells. Benzene was detected at levels at or above the Vermont Ground Water Enforcement Standard (GWES) of 5 parts per billion (ppb) in monitoring wells MW-1 (108 ppb) and MW-92-2 (5 ppb). Ethyl benzene was detected in MW-1 at 1,230 ppb, above the GWES of 680 ppb. Xylene was detected in MW-1 at 8,035 ppb, above the GWES of 400 ppb. Toluene concentrations did not exceed the GWES of 2,420 ppb in any of the sampled wells.

BTEX compounds are present in both gasoline and diesel fuels, although concentrations are far higher in gasoline. MTBE is an octane-boosting additive used only in gasoline fuels; it was first commercially added to gasoline in approximately 1980. No GWES exists for MTBE, although the Vermont Department of Health has issued a Vermont Health Advisory guideline standard of 40 ppb for the compound. MTBE was detected in MW-1 at 1,060 ppb, and in MW-2 at 4 ppb. The presence of MTBE in the ground water samples at high concentrations relative to

the BTEX compounds suggests that the ground water contamination is largely due to releases of gasoline since 1980.

The geographic distribution of contaminants at the site also suggests that the gasoline USTs are the principal source of ground water contamination at the site. As shown in Figure 4, petroleum concentrations in the ground water sample from the monitoring well installed downgradient of the diesel UST were only slightly above analytical detection limits; petroleum concentrations downgradient of the gasoline USTs and dispensers were considerably higher.

One of the sampled wells, MW-92-2, had also been sampled for petroleum compounds during the 1992 WH&N Phase II ESA. The most recent sample results for this well are compared with the February 1992 results in Figure 5. The figure shows that the most recent petroleum compound concentrations are generally slightly lower than those measured in 1992, suggesting that no significant additional product releases have occurred in the vicinity of this well since 1992.

Results of the petroleum fingerprint analyses are also presented in Appendix C. The laboratory analyst concluded the following:

- "The MW-1 water sample was found to contain gasoline with a minor amount of heavy petroleum distillate of the No.2 fuel oil or diesel fuel type. The C-17/pristane ratio is approximately 0.18, meaning old fuel oil product -- 18 years of degradation using the calibration of Christiansen and Larson (GWMR, Fall 1993)."
- "The MW-92-2 sample was found to contain a low, but chromatographically discernible concentration of gasoline."
- "The concentration of petroleum product components in sample MW-2 was too low for positive identification."

Analytical results from the QA/QC samples indicate that adequate QA/QC was maintained during sample collection and analysis. No petroleum compounds were detected in the trip blank or equipment blank samples. Petroleum compound concentrations reported for the duplicate sample of monitoring well MW-2 were within 1 ppb of the results for the MW-2 sample.

4.0 RECEPTOR SURVEY

During the course of this site assessment, GWV conducted a survey to identify potential receptors of the contamination. The survey was accomplished both visually and by conducting off-site research.

Although the site and all nearby residences are reportedly served by a municipal water supply system, well completion records at the State of Vermont indicate that four private drinking water supply wells are located within 1/2 mile of the site. All of the listed wells are reportedly installed in a bedrock aquifer that underlies the shallow surficial aquifer at the site.

Two of the supply wells, recorded as owned by Donald Paquette and Thomas Falco, respectively, are located on Hyde Road approximately 1,000 feet west, and upgradient, of the site.

The other two water supply wells within one-half mile of the site are located east of, and downgradient from, the site along East Shore Road. One well, listed as owned by Wilson Bruley and installed in 1985, is located approximately 1,500 feet east of the site. A second well, listed as owned by Alan Pietricola and installed in 1979, is located approximately 2,000 feet east of the site.

The on-site building has an unfinished basement. According to Steve Debenham, water occasionally flows into the basement along the base of the west wall. A sump pump located near the building's southeast corner removes accumulated water and discharges it to the surface.

The nearest building in the downgradient direction (to the east) is a residence located on the northeast corner of the intersection, approximately 150 feet northeast of the closed diesel UST. The residence appears to have a basement.

5.0 RISK ASSESSMENT

On the basis of the findings reached during this investigation, GWV has qualitatively evaluated the risks that the contamination at the site poses to identified potential receptors. The results of the risk assessment suggest that the existing contamination is unlikely to pose a significant threat to any of the identified sensitive receptors.

When petroleum is present as a separate phase in the subsurface, it poses a potential risk of explosion if vapors migrate into buildings or wells. Free-phase petroleum was not observed at this site, however, so such risks are not deemed significant at this site.

Petroleum fuels contain several compounds that are hazardous to human health, including benzene, which is listed by the U.S. Environmental Protection Agency (EPA) as a known carcinogen. The principal routes by which humans may be exposed to subsurface petroleum contamination are: ingestion of compounds that have migrated as dissolved constituents in water into drinking water supplies; and inhalation of vapors that have migrated into occupied buildings.

The risk of ingestion of petroleum compounds can be assessed by evaluating the likelihood that petroleum compounds detected at the site will impact nearby drinking water supplies. The highest benzene level, 108 ppb in monitoring well MW-1, is 21.6 times the enforceable Maximum Contaminant Level (MCL) drinking water standard of 5 ppb. The highest ethyl benzene concentration, 1,230 ppb in monitoring well MW-1, is approximately 1.8 times MCL of 700 ppb. The highest MTBE level, 1,060 ppb in MW-1, is 27 times the guideline Vermont Health Advisory standard of 40 ppb (there is no MCL for MTBE at present). The nearest identified downgradient drinking water wells are installed in the bedrock aquifer and are located at least 1,500 feet from the site. Considering the probable low permeability of the glacial till soils that underlie the site and the likely poor hydraulic connection between these soils and the underlying bedrock, it is unlikely that petroleum compounds in the surficial aquifer at the site will impact any drinking water supplies.

The risk of petroleum vapor inhalation can be assessed by evaluating the likelihood that petroleum compounds will migrate in vapor form into nearby buildings. The on-site building is located upgradient from the UST systems at the site. Ground water that enters the basement reportedly originates along the west wall, at a point that is significantly higher than the water table near the USTs. The basement was inspected during a 16 March 1994 site visit. Water was present in the sump pump pit; no odors or sheens were observed on the water. The risk of future vapor migration into the building basement is thus considered to be low.

The nearest downgradient building is located over 150 feet from the UST systems at the site. The absence of free-phase petroleum product at the site and the relatively low dissolved petroleum concentrations, together with the probable low permeability of the glacial till soils underlying the area, suggests that the existing ground water contamination is unlikely to result in the migration of detectable levels of hydrocarbon vapors into buildings located downgradient from the site.

Petroleum compounds can also impact surface water bodies and organisms. Lake Champlain is the likely ultimate discharge point of ground water that flows past the site. Given the expected low flow velocity through the glacial till soils, however, it is likely that the natural processes of adsorption, dilution, degradation, and dispersion will reduce the levels of petroleum compounds in ground water to below detectable levels prior to discharge into the lake.

6.0 CONCLUSIONS

On the basis of the above-described investigation, Ground Water of Vermont has concluded the following:

1. Soils and ground water at the site have been impacted by petroleum compounds.
2. The petroleum compounds appear to have been released from underground storage tank systems or dispensers at the site.
3. The results of petroleum fingerprint analyses on ground water samples, together with the presence of the gasoline additive MTBE in the ground water and the geographic distribution of the ground water contamination, suggest that the gasoline UST systems at the site are the principal source of the soil and ground water contamination, and that the closed diesel UST was a minor source of the contamination.
4. The source, amount, and duration of the gasoline release or releases could not be determined. It is likely that occasional spills and overfills have occurred during the reportedly long history of site use for the retail sale of gasoline.
5. It is likely that the source of the diesel release or releases was at least in part a hole in the 500-gallon diesel UST that was cleaned and closed in place in October 1993. The amount and duration of the diesel release are unknown, although the apparent age of the diesel compounds detected in ground water suggests that the release or releases were not recent.
6. Soils underlying the site consist of glacial till, which generally has a low permeability. The bedrock underlying the site is mapped as a limy shale, which is also likely to have relatively low permeability.
7. Ground water in the glacial till aquifer at the site was measured to be flowing toward the east, at a gradient of approximately 12.5%. The unusually high ground water gradient also suggests that the glacial till aquifer has a low permeability.
8. The existing ground water contamination at the site does not appear to pose a significant threat to any nearby identified sensitive receptors.

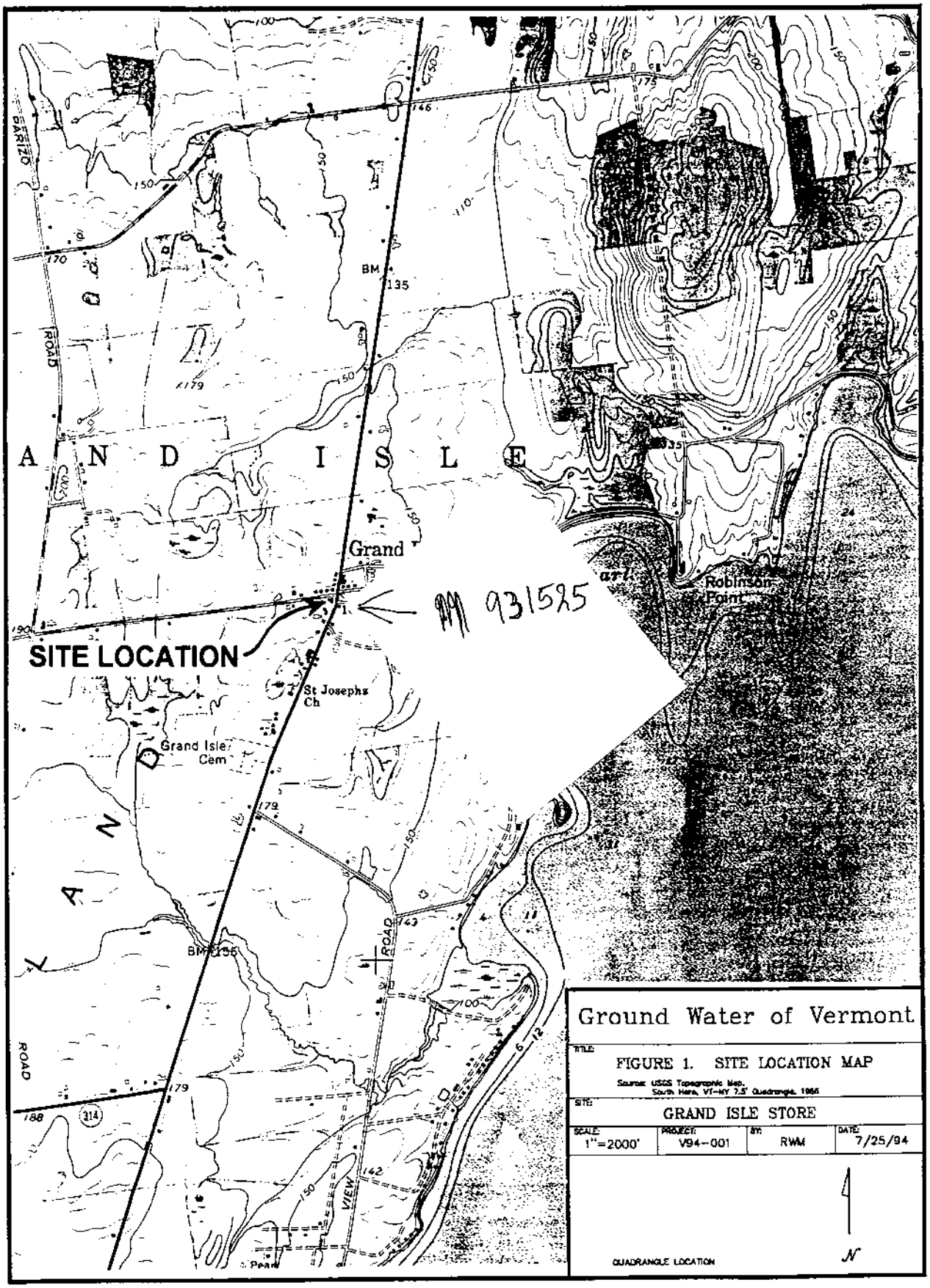
7.0 RECOMMENDATIONS

On the basis of the findings reached during this investigation, Ground Water of Vermont makes the following recommendations:

1. Conduct quarterly monitoring of monitoring wells MW-1, MW-2, and MW 92-2 for one year, with analysis for volatile petroleum hydrocarbons by EPA Method 8020.
2. At the completion of the year of quarterly monitoring, prepare a report that presents the analytical results and ground water flow measurements, and evaluates whether the site can be considered for closure and removal from the Vermont Hazardous Sites List.
3. Because the majority of the ground water contamination appears to be related to the gasoline USTs owned by S.B. Collins, the costs for the recommended quarterly monitoring should be shared appropriately between the responsible parties.

APPENDIX A

Figures and Tables



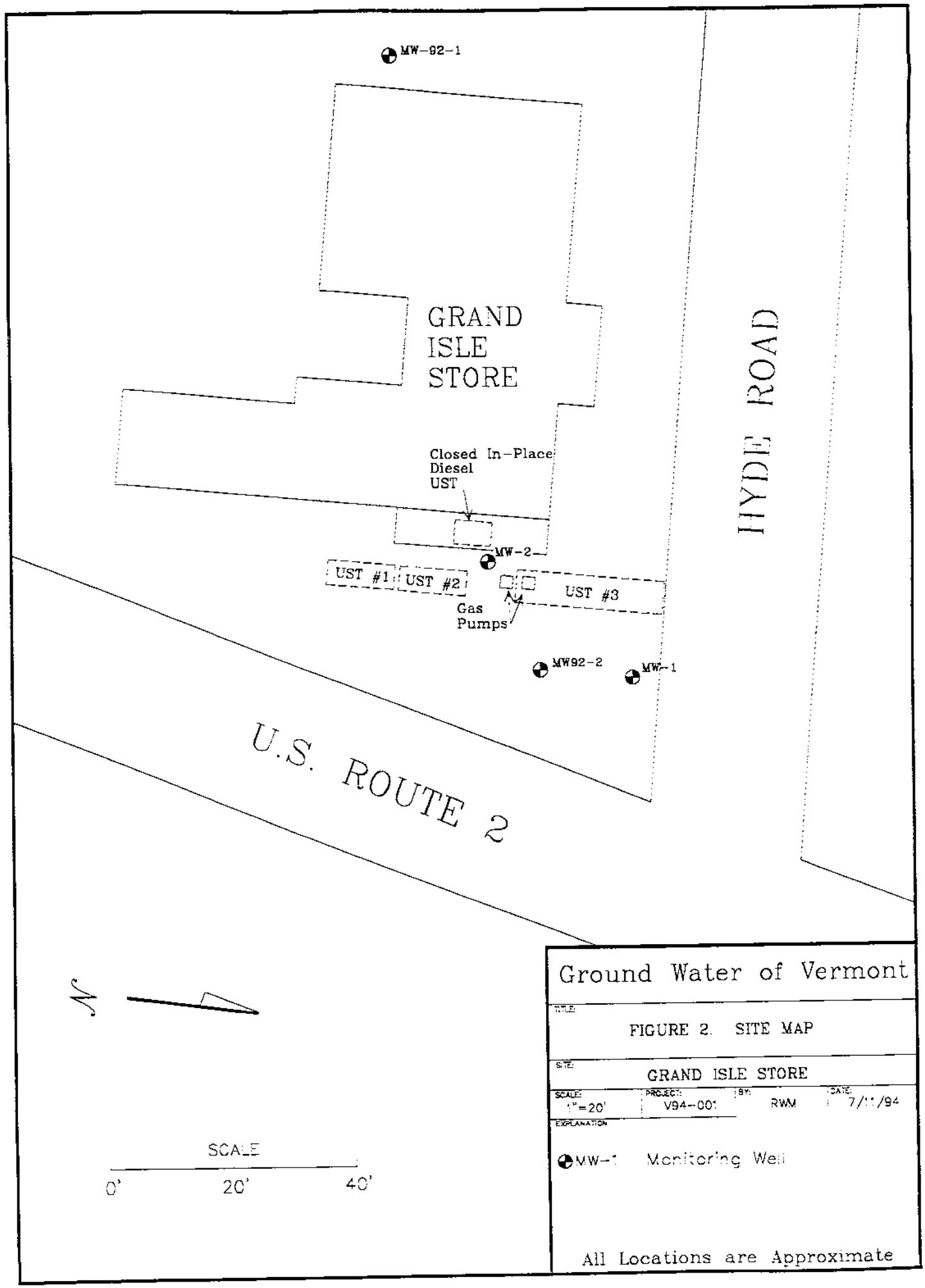
Ground Water of Vermont

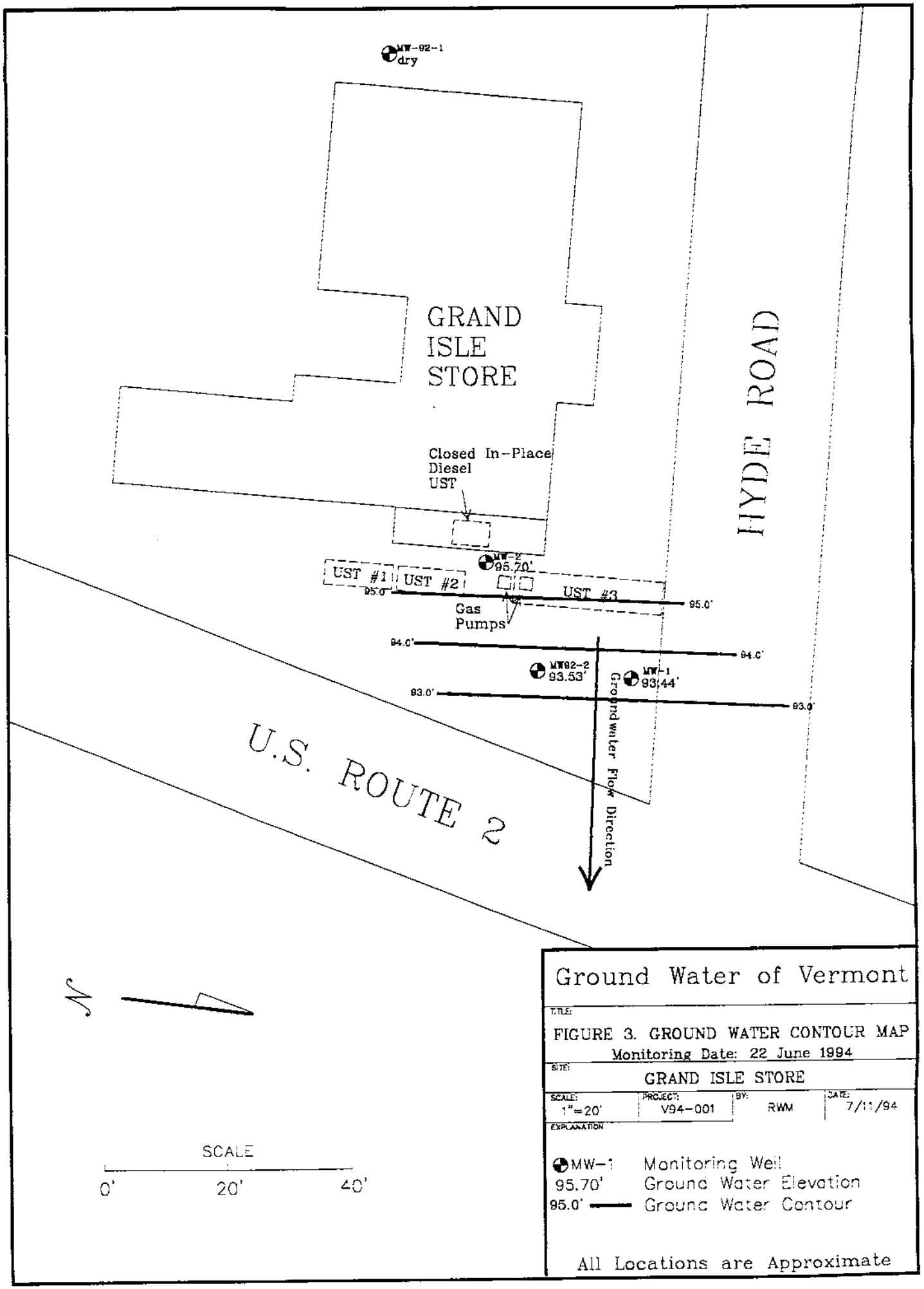
TITLE: FIGURE 1. SITE LOCATION MAP

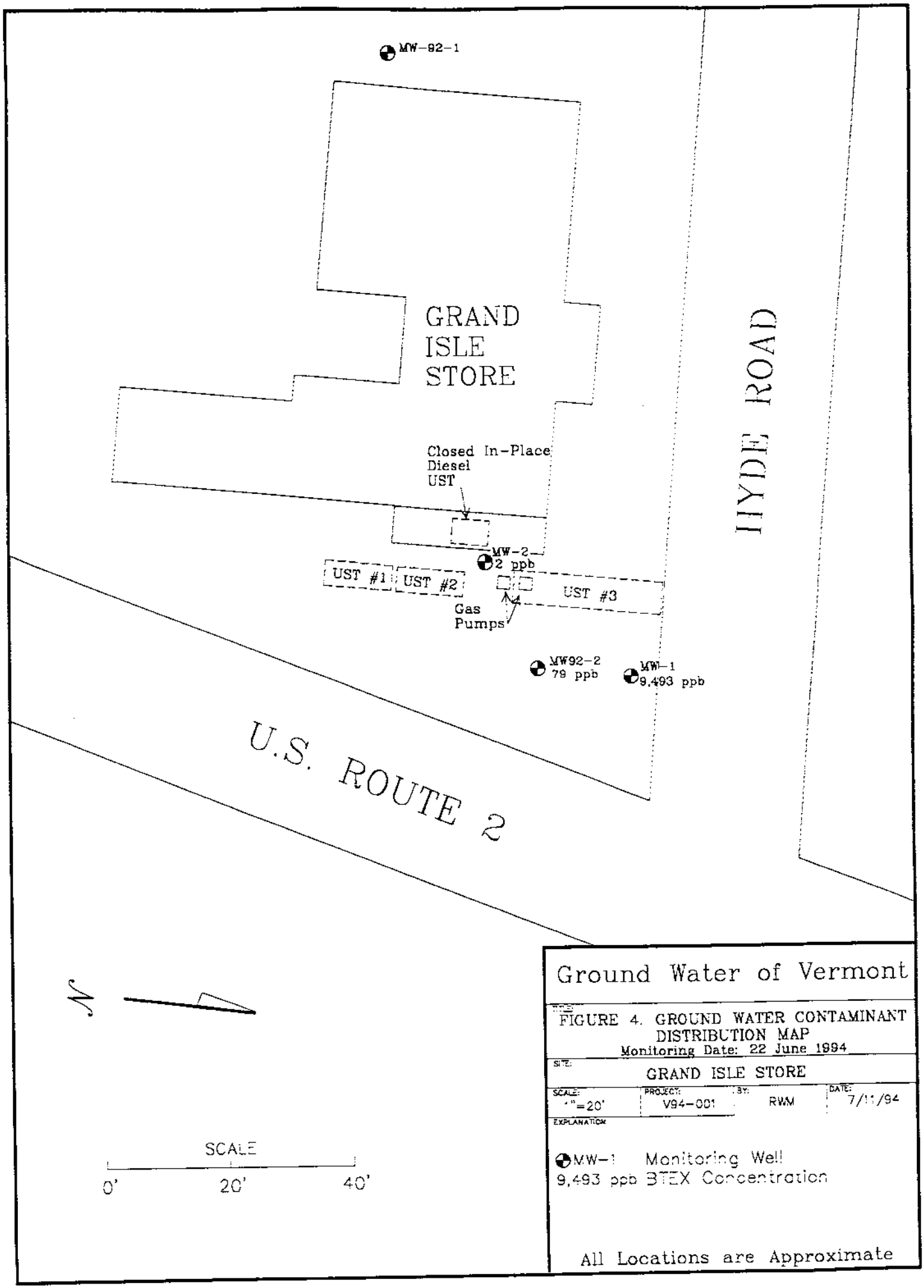
Source: USGS Topographic Map, South Hero, VT-NY 7.5' Quadrangle, 1955

SITE: GRAND ISLE STORE

SCALE:	PROJECT:	BY:	DATE:
1"=2000'	V94-001	RWM	7/25/94


MW-92-1
GRAND
ISLE
STORE
HYDE ROAD
Closed In-Place
Diesel
UST
MW-2
UST #1
UST #2
UST #3
Gas
Pumps
MW92-2
MW-1
U.S. ROUTE 2
N
SCALE
0'
20'
40'
Ground Water of Vermont
TITLE:
FIGURE 2. SITE MAP
SITE:
GRAND ISLE STORE
SCALE:
1"=20'
PROJECT:
V94-001
BY:
RWM
DATE:
7/11/94
EXPLANATION
MW-1 Monitoring Well
All Locations are Approximate


MW-92-1
dry
GRAND
ISLE
STORE
HYDE ROAD
Closed In-Place
Diesel
UST
MW-2
95.70'
UST #1
UST #2
UST #3
95.0'
95.0'
Gas
Pumps
94.0'
94.0'
MW92-2
93.53'
MW-1
93.44'
93.0'
93.0'
Groundwater Flow Direction
U.S. ROUTE 2
N
SCALE
0'
20'
40'
Ground Water of Vermont
TITLE:
FIGURE 3. GROUND WATER CONTOUR MAP
Monitoring Date: 22 June 1994
SITE:
GRAND ISLE STORE
SCALE: 1"=20'
PROJECT: V94-001
BY: RWM
DATE: 7/11/94
EXPLANATION
MW-1 Monitoring Well
95.70' Ground Water Elevation
95.0' Ground Water Contour
All Locations are Approximate



Ground Water of Vermont

FIGURE 4. GROUND WATER CONTAMINANT DISTRIBUTION MAP
Monitoring Date: 22 June 1994

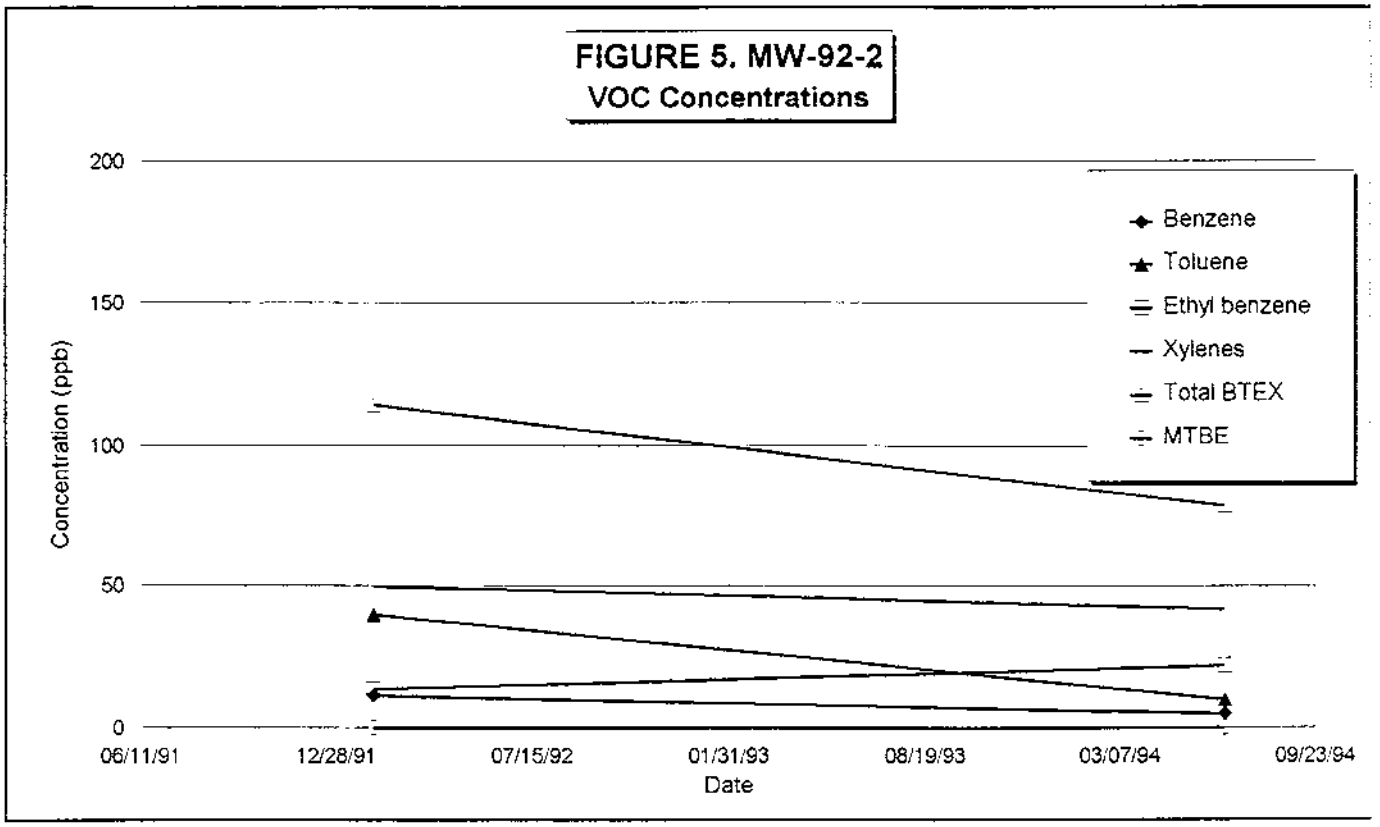
SITE: GRAND ISLE STORE

SCALE:	PROJECT:	BY:	DATE:
1"=20'	V94-001	RWM	7/11/94

EXPLANATION

MW-1 Monitoring Well
9,493 ppb BTEX Concentration

All Locations are Approximate



Ground Water Analytical Results --Monitoring Well MW-92-2

Date	Benzene	Toluene	Ethyl benzene	Xylenes	Total BTEX	MTBE
02/04/92	**11**	**40**	**14**	**50**	**115**	TBQ
06/22/94	**5**	**10**	**22**	**42**	**79**	BPQL<5
VT Ground Water Std.	**5**	**2,420**	**680**	**400**		None*
VT. Drinking Water Std.	**5**	**1,000**	**700**	**10,000**		None*

Notes: Results given in parts per billion (ppb)

BPQL<5 - Below Practical Quantitation Limit of 5 ppb

TBQ - Trace Below Quantitation Limits

* Compound has a Health Advisory Guideline Standard of 40 ppb

Ref: 94001f05.wk4

TABLE 1. GROUND WATER ELEVATION CALCULATIONS

Grand Isle Store
Grand Isle, Vermont

Monitoring Date: 22 June 1994

Well I.D.	Well Depth	Top of Casing Elevation	Depth To Water	Water Table Elevation
MW-92-1	7.0	107.58	dry	-
MW-92-2	8.0	98.33	4.80	93.53
MW-1	6.0	97.51	4.07	93.44
MW-2	9.0	100.23	4.53	95.70

All values reported in feet, arbitrary datum

Ref: 94001t01.wk4

TABLE 2. SUMMARY OF GROUND WATER ANALYSES

Grand Isle Store
Grand Isle, Vermont

Monitoring Date: 22 June 1994

Station	Date	Benzene	Toluene	Ethyl benzene	Xylenes	Total BTEX	MTBE
MW 92-2	06/22/94	**5**	**10**	**22**	**42**	**79**	BPQL<100
MW-1	06/22/94	**108**	**120**	**1,230**	**8,035**	**9,493**	**1,060**
MW-2	06/22/94	**2**	BPQL<1	BPQL<1	BPQL<3	**2**	**4**
MW-2 Duplicate	06/22/94	**3**	BPQL<1	BPQL<1	BPQL<3	**3**	**3**
Equipment Blank	06/22/94	BPQL<1	BPQL<1	BPQL<1	BPQL<3	BPQL	BPQL<1
Trip Blank	06/22/94	BPQL<1	BPQL<1	BPQL<1	BPQL<3	BPQL	BPQL<1
Drinking Water Standard		**5**	**1,000**	**700**	**10,000**		**None***
Ground Water Enforcement Standard	--	**5**	**2,420**	**680**	**400**		**None***

Note: Concentrations Reported in Parts Per Billion (ppb)
BPQL <1 = Below Practical Quantitation Limit of 1 (ppb)
* Compound has a Vermont Health Advisory guideline standard of 40 ppb

Ref:94001t02.wk4

APPENDIX B

Boring Logs

WELL NUMBER MW-1

PROJECT Grand Isle Store

LOCATION Grand Isle, VT

DATE DRILLED 6/15/94 TOTAL DEPTH OF HOLE 6'

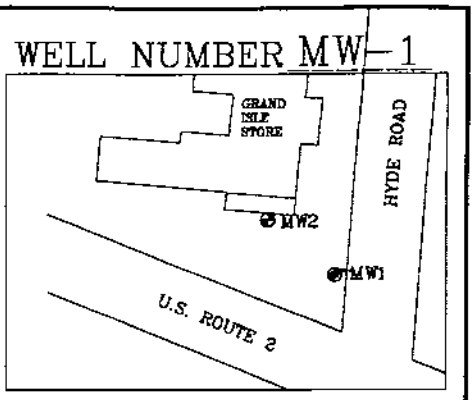
DIAMETER 2.75"

SCREEN DIA. 2" LENGTH 3.5' SLOT SIZE 0.010"

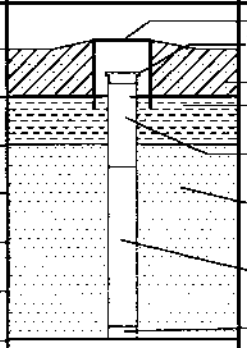
CASING DIA. 2" LENGTH 2' TYPE PVC

DRILLING CO. Adams Engrng DRILLING METHOD Vibratory

DRILLER Jerry Adams LOG BY Ron Miller



GROUND WATER OF VERMONT

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0–6		ROAD BOX LOCKING WELL CAP CONCRETE BENTONITE WELL RISER NATIVE FILL WELL SCREEN BOTTOM CAP	1' – 2' 358 ppm 4' – 6' 1,047 ppm	Olive silty TILL, tr. clay, moist "weathered" gasoline odor WATER TABLE Olive silty TILL, wet, odor Olive silty TILL and weathered SHALE bedrock, wet, odor BASE OF EXPLORATION AT 6'	0–26

WELL NUMBER MW-2

PROJECT Grand Isle Store

LOCATION Grand Isle, VT

DATE DRILLED 6/15/94 TOTAL DEPTH OF HOLE 9'

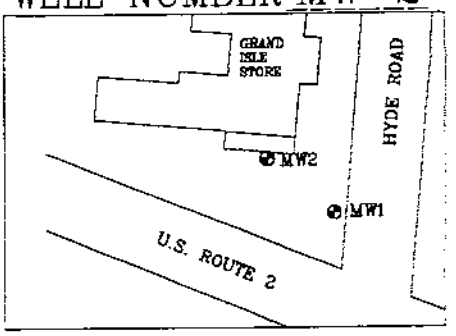
DIAMETER 2.75"

SCREEN DIA. 2" LENGTH 6.2' SLOT SIZE 0.010"

CASING DIA. 2" LENGTH 2' TYPE PVC

DRILLING CO. Adams Engrng DRILLING METHOD Vibratory

DRILLER Jerry Adams LOG BY Ron Miller



GROUND WATER OF VERMONT

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0		ROAD BOX LOCKING WELL CAP			0
1		CONCRETE		Brown SAND and GRAVEL FILL, moist no odor	1
2		BENTONITE WELL RISER	1' - 3' 101 ppm	Brown silty TILL, moist, no odor	2
3			3' - 4' 310 ppm	WATER TABLE	3
4			4' - 5' 143 ppm	Gray, silty TILL, wet, odor	4
5			5' - 6' 164 ppm	Gray sandy TILL w/ rock frags, dry slight odor	5
6		NATIVE FILL			6
7		WELL SCREEN			7
8					8
9		BOTTOM CAP	8' -9' 478 ppm	Olive silty TILL and weathered SHALE bedrock, wet, odor	9
10				BASE OF EXPLORATION AT 9'	10
11					11
12					12
13					13
14					14
15					15
16					16
17					17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25
26					26

APPENDIX C

Laboratory Report Forms

LABORATORY ANALYSIS

CLIENT NAME:	Groundwater of Vermont	REF #:	9202
ADDRESS:	The Chase Mill	PROJECT NO.:	V94-001
	One Mill Street, Box C-5		
	Burlington, VT 05401		
SAMPLE LOCATION:	Grand Isle Store	DATE OF SAMPLE:	6/22/94
SAMPLER:	Ron Miller	DATE OF RECEIPT:	6/23/94
		DATE OF ANALYSIS:	7/5,6,7,8/94
ATTENTION:	Ron Miller	DATE OF REPORT:	7/7,8/94

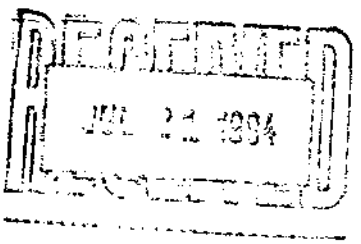
Pertaining to the analyses of specimens submitted under the accompanying chain of custody form, please note the following:

- Water samples submitted for VOC analysis were preserved with HCl.
- Specimens were processed and examined according to the procedures outlined in the specified method.
- Holding times were honored.
- Instruments were appropriately tuned and calibrations were checked with the frequencies required in the specified method.
- Blank contamination was not observed at levels interfering with the analytical results.
- Continuing calibration standards were monitored at intervals indicated in the specified method. The resulting analytical precision and accuracy were determined to be within method QA/QC acceptance limits.
- The efficiency of analyte recovery for individual samples was monitored by the addition of surrogate analytes to all samples, standards, and blanks. Surrogate recoveries were found to be within laboratory QA/QC acceptance limits, unless noted otherwise.

Reviewed by:

Denise E. Bouchard

Denise E. Bouchard
Technician, Chemical Services



MicroAssays of Vermont, Inc. P.O. Box 189 Middlesex, Vermont 05602 (802) 223-1468 FAX 223-8688

LABORATORY REPORT

EPA METHOD 8020 ANALYTES + MTBE with GC/MS Confirmation

CLIENT NAME:	Groundwater of Vermont	PROJECT CODE:	V94-001
PROJECT NAME:	Grand Isle Store	REF.#:	9,202
REPORT DATE:	July 8, 1994	STATION:	MW-1
DATE SAMPLED:	June 22, 1994	TIME SAMPLED:	14:00
DATE RECEIVED:	June 23, 1994	SAMPLER:	Ron Miller
ANALYSIS DATE:	July 6,7, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Conc. (µg/L)
Benzene	100	108
Toluene	100	120
Ethylbenzene	100	1,230
m+p-Xylene	200	7,730
o-Xylene	100	305
Chlorobenzene	100	BPQL
1,2-Dichlorobenzene	100	BPQL
1,3-Dichlorobenzene	100	BPQL
1,4-Dichlorobenzene	100	BPQL
MTBE	100	BPQL

Surrogate % Recovery: 98 %

BPQL = Below Practical Quantitation Limit (PQL).
Note: These results were confirmed with a replicate analysis.

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LABORATORY REPORT

EPA METHOD 8020 ANALYTES + MTBE with GC/MS Confirmation

CLIENT NAME:	Groundwater of Vermont	PROJECT CODE:	V94-001
PROJECT NAME:	Grand Isle Store	REF.#:	9,202
REPORT DATE:	July 8, 1994	STATION:	MW-2
DATE SAMPLED:	June 22, 1994	TIME SAMPLED:	14:45
DATE RECEIVED:	June 23, 1994	SAMPLER:	Ron Miller
ANALYSIS DATE:	July 6,7, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Conc. (µg/L)
Benzene	1	2
Toluene	1	BPQL
Ethylbenzene	1	BPQL
m+p-Xylene	2	BPQL
o-Xylene	1	BPQL
Chlorobenzene	1	BPQL
1,2-Dichlorobenzene	1	BPQL
1,3-Dichlorobenzene	1	BPQL
1,4-Dichlorobenzene	1	BPQL
MTBE	1	4

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).
Note: These results were confirmed with a replicate analysis.

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LABORATORY REPORT

EPA METHOD 8020 ANALYTES + MTBE with GC/MS Confirmation

CLIENT NAME:	Groundwater of Vermont	PROJECT CODE:	V94-001
PROJECT NAME:	Grand Isle Store	REF.#:	9,202
REPORT DATE:	July 7, 1994	STATION:	MW-92-2
DATE SAMPLED:	June 22, 1994	TIME SAMPLED:	14:20
DATE RECEIVED:	June 23, 1994	SAMPLER:	Ron Miller
ANALYSIS DATE:	July 5, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Conc. (µg/L)
Benzene	5	5
Toluene	5	10
Ethylbenzene	5	22
m+p-Xylene	10	24
o-Xylene	5	18
Chlorobenzene	5	BPQL
1,2-Dichlorobenzene	5	BPQL
1,3-Dichlorobenzene	5	BPQL
1,4-Dichlorobenzene	5	BPQL
MTBE	5	BPQL

Surrogate % Recovery: 98 %

BPQL = Below Practical Quantitation Limit (PQL).

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LABORATORY REPORT

EPA METHOD 8020 ANALYTES + MTBE with GC/MS Confirmation

CLIENT NAME:	Groundwater of Vermont	PROJECT CODE:	V94-001
PROJECT NAME:	Grand Isle Store	REF.#:	9,202
REPORT DATE:	July 8, 1994	STATION:	Duplicate
DATE SAMPLED:	June 22, 1994	TIME SAMPLED:	Not Given
DATE RECEIVED:	June 23, 1994	SAMPLER:	Ron Miller
ANALYSIS DATE:	July 6,7,8, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Conc. (µg/L)
Benzene	1	3
Toluene	1	BPQL
Ethylbenzene	1	BPQL
m+p-Xylene	2	BPQL
o-Xylene	1	BPQL
Chlorobenzene	1	BPQL
1,2-Dichlorobenzene	1	BPQL
1,3-Dichlorobenzene	1	BPQL
1,4-Dichlorobenzene	1	BPQL
MTBE	1	3

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).
Note: These results were confirmed with replicate analyses .

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LABORATORY REPORT

EPA METHOD 8020 ANALYTES + MTBE with GC/MS Confirmation

CLIENT NAME:	Groundwater of Vermont	PROJECT CODE:	V94-001
PROJECT NAME:	Grand Isle Store	REF.#:	9,202
REPORT DATE:	July 7, 1994	STATION:	Equipment Blank
DATE SAMPLED:	June 22, 1994	TIME SAMPLED:	15:00
DATE RECEIVED:	June 23, 1994	SAMPLER:	Ron Miller
ANALYSIS DATE:	July 6, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Conc. (µg/L)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
m+p-Xylene	2	BPQL
o-Xylene	1	BPQL
Chlorobenzene	1	BPQL
1,2-Dichlorobenzene	1	BPQL
1,3-Dichlorobenzene	1	BPQL
1,4-Dichlorobenzene	1	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).

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LABORATORY REPORT

EPA METHOD 8020 ANALYTES + MTBE with GC/MS Confirmation

CLIENT NAME:	Groundwater of Vermont	PROJECT CODE:	V94-001
PROJECT NAME:	Grand Isle Store	REF.#:	9,202
REPORT DATE:	July 7, 1994	STATION:	Trip Blank
DATE SAMPLED:	June 22, 1994	TIME SAMPLED:	13:00
DATE RECEIVED:	June 23, 1994	SAMPLER:	Ron Miller
ANALYSIS DATE:	July 6, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Conc. (µg/L)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
m+p-Xylene	2	BPQL
o-Xylene	1	BPQL
Chlorobenzene	1	BPQL
1,2-Dichlorobenzene	1	BPQL
1,3-Dichlorobenzene	1	BPQL
1,4-Dichlorobenzene	1	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 101%

BPQL = Below Practical Quantitation Limit (PQL).

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CLIENT NAME:	Groundwater of Vermont	PROJECT CODE:	V94-001
PROJECT NAME:	Grand Isle Store	REF.#:	9,202
REPORT DATE:	July 18, 1994	STATION:	various (3)
DATE SAMPLED:	June 22, 1994	TIME SAMPLED:	14:00 - 14:45
DATE RECEIVED:	June 23, 1994	SAMPLER:	Ron Miller
ANALYSIS DATE:	July 16, 1994	SAMPLE TYPE:	Water

PETROLEUM PRODUCT IDENTIFICATION - WATER

A semivolatile organic compound analytical method was developed with the objective of facilitating the discrimination of common petroleum products as contaminants in water. A brief outline of this procedure follows:

- Extract petroleum product components from water into methylene chloride.
- Inject 2 microliter of methylene chloride extract into split injection port of GC with DB-5 capillary column. Injection temperature = 40°C, hold 1 minute. Temperature program = 10°C/min to 320°C. Detector is Ion Trap GC/MS tuned for DFTPP.
- From the full mass spectral data obtained for every scan in the chromatogram, the mass spectral data are displayed in the form of selected ion chromatograms. These selected ion chromatograms along with the total ion chromatogram (TIC) are presented in a stacked form with time or scans as the common axis. The selected ions are grouped together to be specific for the following classes of hydrocarbon compounds: (a) alkanes (aliphatics), (b) olefins and cyclic alkanes, (c) benzene, (d) alkylbenzenes, (e) alkylnaphthalenes, and (f) alkylanthracenes.
- The resulting compound class-specific chromatographic patterns are compared to those obtained from reference petroleum products such as gasoline, kerosene, and No. 2 fuel oil, in saturated solution with water.

Note: The solubility of various petroleum components from different petroleum products in water is highly discriminatory, however, the presence or absence of fuel oil components is discernible.

RESULTS:

1. The MW-1 water sample was found to contain gasoline with a minor amount of heavy petroleum distillate of the No. 2 fuel oil or diesel fuel type. The C-17/pristane ratio is approximately 0.18, meaning old fuel oil product - 18 years of degradation using the calibration of Christensen and Larson (GWMR, fall 1993).

2. The MW-92-2 sample was found to contain a low, but chromatographically discernible concentration of gasoline.

3. The concentration of petroleum product components in sample MW-2 was too low for positive identification.

Brendan McMahon, Ph.D.
Director, Chemical Services

GroundWater of Vermont

The Chace Mill, One Mill Street, Box C-5, Burlington, Vermont, 05401
(802)-860-6065 (802)-860-6076 Fax

CHAIN OF CUSTODY RECORD

LABORATORY

ANALYSIS STATUS:
_____ RUSH (2-DAY)
_____ PRIORITY (4-DAY)
_____ BEST AVAILABLE TIME

PROJECT NUMBER: V94-001
PROJECT NAME: GRAND ISLE STORE
PROJECT LOCATION: GRAND ISLE, VT
PROJECT MANAGER: RON MILLER
COLLECTED BY: RON MILLER
DATE: 6/22/94

PAGE 1 OF 1

✓
0202

SAMPLE ID	DATE	TIME	SAMPLE MATRIX	TYPE OF CONTAINER	# CONT.	PRESRVD
✓ TRIP BLANK JD	6/22/94	13:00	WOK	40ml VOA Vial	2	IA
✓ MW1	6/22/94	14:00	WOK	40ml VOA Vial	2	IA
✓ MW92-2 1:5	6/22/94	14:20	WOK	40ml VOA Vial	2	IA
✓ MW2	6/22/94	14:45	WOK	40ml VOA Vial	2	IA
✓ DUPLICATE	6/22/94		W	40ml VOA Vial	2	IA
✓ EQUIPMENT BLANK JD	6/22/94	15:00	WOK	40ml VOA Vial	2	IA

ANALYSIS REQUESTED

METALS - PLEASE LIST: NA ( ) EP-TOX ( ) (6)	OIL & GREASE: IR ( ) GRAV. ( )	VOLATILE ORGANICS: 624 ( ) 601 ( ) 602 ( ) 8010 ( ) 8015 ( ) 8020 & BTXE (X)	EXTRACTABLES: ACIDS ( ) B/N ( ) PCBs ( ) PESTS ( ) 8040/8080 ( )	TSS ( ) TDS ( ) pH ( ) SPEC COND ( )	BACTERIA: SPC ( ) TOT COLI ( ) FEC COLI ( )	CYANIDE: AMEN ( ) TOT ( )	CL ( ) F ( ) SO4 ( )	NOS ( ) NO2 ( ) NH3 ( )	TCLP: METALS ( ) VOLATILES ( ) PESTICIDES ( ) SEMIVOLATILES ( ) HERBICIDES ( )	OTHER PETROLEUM FINGERPRINT I.D.	OTHER	REMARKS
		X										
		X								X		
		X								X		
		X								X		
		X										
		X										

MATRIX
W = AQUEOUS
S = SOLIDS

PRESERVATIVE
I = ICED
A = ACIDIFIED (4 DROPS 1:1 HCl)
B = BASE
N = SODIUM BISULFATE

RELINQUISHED BY	DATE	TIME	RECEIVED BY
[signature]	6/23/94	8 AM	[signature]